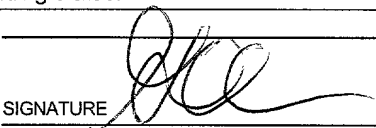



JC10 Rec'd PCT/PTO 07 MAR 2002

FORM PTO-1390 (Modified) (REV 5-93)		U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE		ATTORNEY'S DOCKET NUMBER	
TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371				016782-0245	
				U.S. APPLICATION NO. (If known, enter 37 C.F.R. 1.53(a)(2) Unassigned) 10/070462	
INTERNATIONAL APPLICATION NO. PCT/EP00/06985		INTERNATIONAL FILING DATE 07/19/2000		PRIORITY DATE CLAIMED 09/10/1999	
TITLE OF INVENTION WELDED MICROFILTER TUBE COMPRISING SINTERED FIBERS					
APPLICANT(S) FOR DO/EO/US Noël VANDEMAELE and Guy VANHOUTTE					
Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:					
1	<input checked="" type="checkbox"/>	This is a FIRST submission of items concerning a filing under 35 U.S.C. 371.			
2	<input type="checkbox"/>	This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U.S.C. 371.			
3	<input checked="" type="checkbox"/>	This express request to begin national examination procedures (35 U.S.C. 371(f)) at any time rather than delay examination until the expiration of the applicable time limit set in 35 U.S.C. 371(b) and PCT Articles 22 and 39(1).			
4	<input checked="" type="checkbox"/>	A proper Demand for International Preliminary Examination was made by the 19 th month from the earliest claimed priority date.			
5	<input checked="" type="checkbox"/>	A copy of the International Application as filed (35 U.S.C. 371(c)(2)) <input type="checkbox"/> is transmitted herewith (required only if not transmitted by the International Bureau). <input checked="" type="checkbox"/> has been transmitted by the International Bureau. <input type="checkbox"/> is not required, as the application was filed in the United States Receiving Office (RO/US)			
6	<input type="checkbox"/>	A translation of the International Application into English (35 U.S.C. 371(c)(2)).			
7	<input checked="" type="checkbox"/>	Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3)) <input type="checkbox"/> are transmitted herewith (required only if not transmitted by the International Bureau). <input type="checkbox"/> have been transmitted by the International Bureau. <input type="checkbox"/> have not been made; however, the time limit for making such amendments has NOT expired. <input checked="" type="checkbox"/> have not been made and will not be made.			
8	<input type="checkbox"/>	A translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).			
9	<input checked="" type="checkbox"/>	An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).			
10	<input type="checkbox"/>	A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).			
11	<input type="checkbox"/>	Applicant claims small entity status under 37 CFR 1.27 .			
Items 12. to 17. below concern other document(s) or information included:					
12	<input checked="" type="checkbox"/>	An Information Disclosure Statement under 37 CFR 1.97 and 1.98.			
13	<input checked="" type="checkbox"/>	An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.			
14	<input checked="" type="checkbox"/>	A FIRST preliminary amendment. <input type="checkbox"/> A SECOND or SUBSEQUENT preliminary amendment.			
15	<input type="checkbox"/>	A substitute specification.			
16	<input type="checkbox"/>	A change of power of attorney and/or address letter.			
17	<input type="checkbox"/>	Other items or information:			

JC13 Rec'd PCT/PTO 07 MAR 2002

U.S. APPLICATION NO. (If known, see 37 C.F.R. 1.50) Unassigned 10/070462		INTERNATIONAL APPLICATION NO. PCT/EP00/06985		ATTORNEY'S DOCKET NUMBER 016782-0245	
18. <input checked="" type="checkbox"/> The following fees are submitted:				CALCULATIONS	
Basic National Fee (37 CFR 1.492(a)(1)-(5): Search Report has been prepared by the EPO or JPO.....\$890.00					
International preliminary examination fee paid to USPTO (37 CFR 1.482)\$710.00					
No international preliminary examination fee paid to USPTO (37 CFR 1.482) but international search fee paid to USPTO (37 CFR 1.445(a)(2))\$740.00					
Neither international preliminary examination fee (37 CFR 1.482) nor International search fee (37 CFR 1.445(a)(2)) paid to USPTO \$1,040.00					
International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(2)-(4)\$100.00					
ENTER APPROPRIATE BASIC FEE AMOUNT =				\$890.00	
Surcharge of \$130.00 for furnishing the oath or declaration later than 20 months from the earliest claimed priority date (37 CFR 1.492(e))					
Claims	Number Filed		Included in Basic Fee	Extra Claims	Rate
Total Claims	14	-	20	= 0	\$18.00
Independent Claims	1	-	3	= 0	\$84.00
Multiple dependent claim(s) (if applicable)					\$280.00
TOTAL OF ABOVE CALCULATIONS =				\$890.00	
Reduction by 1/2 for filing by small entity, if applicable.				\$0.00	
SUBTOTAL =				\$890.00	
Processing fee of \$130.00 for furnishing English translation later the 20 months from the earliest claimed priority date (37 CFR 1.492(f)).				+	
TOTAL NATIONAL FEE =				\$890.00	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). \$40.00 per property +				\$40.00	
TOTAL FEES ENCLOSED =				\$930.00	
				Amount to be: refunded \$	
				charged \$	
a. <input checked="" type="checkbox"/> A check in the amount of \$930.00 to cover the above fees is enclosed.					
b. <input type="checkbox"/> Please charge my Deposit Account No. <u>19-0741</u> in the amount of \$0.00 to the above fees. A duplicate copy of this sheet is enclosed.					
c. <input checked="" type="checkbox"/> The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. <u>19-0741</u> . A duplicate copy of this sheet is enclosed.					
NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.					
SEND ALL CORRESPONDENCE TO:			SIGNATURE 		
Foley & Lardner Customer Number: 22428			NAME GLENN LAW		
			REGISTRATION NUMBER 34,371		
22428					
PATENT TRADEMARK OFFICE					

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Attorney Docket No. 016782-0245

In re patent application of

Noël VANDEMAELE et al.

Serial No.: Unassigned

Filed: March 7, 2002

For: WELDED MICROFILTER TUBE COMPRISING SINTERED FIBERS

PRELIMINARY AMENDMENT

Commissioner for Patents
Washington, D.C. 20231

Sir:

Prior to examination of the above-identified application, Applicants respectfully request that the following amendments be entered into the application:

IN THE CLAIMS:

Please replace Claims 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, and 14 as originally filed with the following amended claims:

--3. (Amended) A tube according to claim 1 wherein said tube has an internal diameter ranging from 8 mm to 200 mm.

4. (Amended) A tube according to claim 1 wherein at least one of said layers has a porosity greater than 70%.

5. (Amended) A tube according to claim 2 wherein said tube comprises two layers, one of said layers having a porosity smaller than 65%.

7. (Amended) A tube according to claim 1 wherein the greatest pore sizes lie outside said overlapping zone.

8. (Amended) A tube according to claim 1 wherein said tube has been sintered.

9. (Amended) A tube according to claim 1, said tube comprising a central rod with a diameter smaller than the internal diameter of said tube.

10. (Amended) A tube according to claim 1, said tube comprising a central vortex or worm with a diameter smaller than the internal diameter of said tube.

11. (Amended) A tube according to claim 1 wherein said tube comprises a stainless steel end cap.

12. (Amended) A tube according to claim 1 wherein said tube comprises an end cap made of a plastic material.

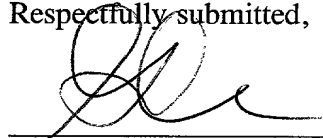
13. (Amended) A tube according to claim 1 wherein said tube further comprises a supplemental layer of a presintered web of steel fibers with a diameter greater than 8 μm , said supplemental layer functioning as a support layer.

14. (Amended) A cross-flow filtering tube according to claim 1.--

REMARKS

Applicant respectfully request that the foregoing amendments to Claims 3, 4, 5, 7, 8, 9, 10, 11, 12, 13, and 14 be entered in order to avoid this application incurring a surcharge for the presence of one or more multiple dependent claims. A marked-up version of the claims showing the changes made is attached.

Respectfully submitted,



March 7, 2002

Date

Glenn Law

Registration No. 34,371

FOLEY & LARDNER
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Washington, D.C. 20007-5109
(202) 672-5300

VERSIONS WITH MARKINGS TO SHOW CHANGES MADE

3. A tube according to [any one of the preceding claims] claim 1 wherein said tube has an internal diameter ranging from 8 mm to 200 mm.

4. A tube according to [any one of the preceding claims] claim 1 wherein at least one of said layers has a porosity greater than 70%.

5. A tube according to any one of claims 2 to 4] claim 2 wherein said tube comprises two layers, one of said layers having a porosity smaller than 65%.

7. A tube according to [any one of the preceding claims] claim 1 wherein the greatest pore sizes lie outside said overlapping zone.

8. A tube according to [any one of the preceding claims] claim 1 wherein said tube has been sintered.

9. A tube according to [any one of the preceding claims] claim 1, said tube comprising a central rod with a diameter smaller than the internal diameter of said tube.

10. A tube according to [any one of claims 1 to 8] claim 1, said tube comprising a central vortex or worm with a diameter smaller than the internal diameter of said tube.

11. A tube according to [any one of the preceding claims] claim 1 wherein said tube comprises a stainless steel end cap.

12. A tube according to [any one of claims 1 to 10] claim 1 wherein said tube comprises an end cap made of a plastic material.

13. A tube according to [any one of the preceding claims] claim 1 wherein said tube further comprises a supplemental layer of a presintered web of steel fibers with a diameter greater than 8 μm , said supplemental layer functioning as a support layer.

- '14. A cross-flow filtering tube according to [any one of the preceding claims]
claim 1.

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WELDED MICROFILTER TUBE COMPRISING SINTERED FIBERS**Field of the invention.**

5 The present invention relates to a filtering tube comprising one or more layers of a presintered web of steel fibers. The present invention particularly relates to a cross-flow filtering tube with microfiltration characteristics, i.e. with a filter rating equal to or below 20 micrometer, preferably below 10 micrometer.

10 A "cross-flow filtering tube" refers to a filtering tube where the incoming fluid enters axially the tube, where the non filtered fluid exits axially the tube and where the filtered fluid exits radially the tube.

Background of the invention.

15 Filtering tubes having as filtering medium a sintered web of steel fibers is known in the art. US-A-3,505,038 discloses a tubular filter medium where the filter medium is mainly formed by compacted mat of steel fibers. The tubular filter medium is made by spirally wrapping a steel fiber mat around an inner cylinder of a woven wire screening mesh to form a tube. The mat and the mesh are consolidated with pressure and
20 sintered into a compact body. The fiber mat performs the major filtration work while the inner screen functions as a safety factor. The fiber mat can be spotwelded to the inner screen.

Such an embodiment, however, presents several disadvantages.

25 A first disadvantage is that, due to the presence of the inner screen, it is difficult to decrease the inner diameter of such tubular structure to below a value where the pump and energy costs required to have the structure function as a cross-flow filter remain below acceptable levels. It is hereby understood that the greater the inner diameter the greater the required pump and energy costs are.

30 A second disadvantage is that such tubular structures are not adapted for microfiltration. Indeed, in order to reach a filter rating below 20 micrometer or even below 10 micrometer the mat of fibers needs to be compacted to such a degree that connecting the mat to a tubular structure causes a lot of technical problems.

Summary of the invention.

It is an object of the present invention to avoid the disadvantages of the prior art.

5 It is another object of the present invention to provide a tubular filtering structure with a filter rating below 10 micrometer.

It is yet another object of the present invention to make it possible to decrease the internal diameter of the tubular filtering structure.

10 According to the invention there is provided a filtering tube with one or more layers of a presintered web of steel fibers. At least one of the layers comprises steel fibers with a diameter smaller than 8 micrometer. The layers are preshaped so as to form easily the tube form. The layers overlap with each other and form an overlapping zone, which may run substantially parallel to the axis of the tube. The overlapping zone is
15 compacted and a continuous resistance weld is created in the overlapping zone.

The term continuous weld is used here to make a distinction with spot welding. With resistance welding it has been possible to make a tubular filter where the greatest pore sizes, as experienced during a standard
20 bubble point test, all lie outside the overlapping or welding zone. Indeed, resistance welding is preferred over other ways of welding, since with resistance welding it is possible to tune and control the amount of electrical input energy so that melting of the very thin fibers is avoided. Also partially melting of the fiber layers has to be avoided as
25 much as possible since melting causes shrinkage and shrinkage may cause cracks and creation of pores with an unacceptable large pore size larger than the original pore size.

30 The invention does not exclude a tube with a supplemental layer of a presintered web of steel fibers with a diameter greater than 8 μm where this supplemental layer functions as a support layer.

Preferably at least one of the layers of the presintered web has a porosity greater than 70%.

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By a suitable choice of fiber diameters, of the compacting degree and of the way of compacting, filter ratings below 20 micrometer and even below 10 micrometer can be obtained.

5 The smaller the fiber diameter and the greater the compacting degree the smaller the obtained filter rating. However, as mentioned above, the degree of compacting is limited.

10 For obtaining filter ratings which are below 5 micrometer and are down to 0.5 micrometer, two or more layers of a fiber web are used. One, relatively thin, highly compacted presintered layer with a small fiber diameter (e.g. 1 μm or 2 μm) and a porosity smaller than 65%, e.g. smaller than 55%, and is combined with another thicker layer which has a porosity higher than 70%, e.g. higher than 80%. The first thin compact layer determines the filter rating while the second relatively
15 thick and highly porous layer functions as a support buffer for the first thin layer during welding and allows for the further compacting in a welding zone during the welding operation.

20 Preferably the thin layer with a porosity lower than 65% is isostatically pressed. Isostatically pressing allows to obtain a homogeneous filter medium where a low filter rating is combined with a porosity which is as high as possible.

In order to allow for suitable welding the preshaped and presintered layers overlap with each other and form an overlapping zone.

25 The welded tube can be sintered afterwards. An advantage of this sintering is that the tube is straightened and that stresses are eliminated. Stress corrosion is avoided in this way.

30 In a preferable embodiment of the invention and in order to decrease further pump and energy costs, a central rod with a diameter smaller than the internal diameter of the tube, is put in the filtering tube so that the available cross-section is substantially decreased. As the cross-section is proportional the fluid flow and as the pump and energy costs

decrease exponentially with decreasing amount of flows, the savings in pump and energy costs can be substantially high.

As a preferred alternative to a central rod, a central vortex or worm can be used. Such a vortex or worm has as a supplementary advantage that it creates many local turbulences in the flow of the fluid. These turbulences may clean the surface of the filter so that cleaning can be postponed and so that the permeate flux remains at a high level during a longer time.

A filtering tube can have at its ends caps in order to facilitate the mounting in a more complex filter structure. Such caps can be made in stainless steel or in a plastic material such as a suitable epoxy. Stainless steel caps are TIG-welded to the filtering tube.

Filtering tubes according to the invention can be used as cross-filtering tubes for the filtration of fluids such as waste waters, oils, ...

Brief description of the drawings.

The invention will now be described into more detail with reference to the accompanying drawings wherein

- FIGURE 1 shows a side view of a filtering tube according to the invention ;
- FIGURE 2 shows how filtering tubes can be built in a larger entity ;
- FIGURE 3 shows a cross-section of a two-layered web of steel fibers ;
- FIGURE 4a shows a cross-section of an overlapping zone of a filtering tube before welding ;
- FIGURE 4b shows how welding is done at the overlapping zone ;
- FIGURE 4c shows a cross-section of an overlapping zone of a filtering tube after welding ;

-5-

- FIGURE 5 shows a transversal cross-section of a filtering tube with a central rod inside ;
- FIGURE 6 shows a longitudinal cross-section of a filtering tube with a central vortex inside.

5

Description of the preferred embodiments of the invention.

FIGURE 1 shows a side view of a filtering tube 10 according to the invention. The filtering tube 10 comprises a cylindrical body 12 which mainly consists of a presintered and preshaped web of steel fibers. A supporting wire screen is not required. The internal diameter of cylindrical body ranges from 8 mm to 200 mm, e.g. from 8 mm to 50 mm. The filtering tube may have a length from 500 mm to 1500 mm, e.g. from 500 mm to 1000 mm. The filtering tube 10 has end caps 14 at both ends. These end caps 14 can be in stainless steel or in a suitable epoxy resin. If the end caps 14 are in steel, they are welded to the tube 10. If the end caps 14 are in epoxy, they are cast to tube 10. The cylindrical body 12 shows a continuous welding line 16 along its length. The filtering tube is adapted to function as cross-filtering tube, i.e. in cross-flow mode. This means that the incoming fluid enters axially, as designated by arrow 18. The filtered fluid exits radially (= arrows 20). The non-filtered fluid exits axially (= arrow 22). This non-filtered fluid may be repumped to enter again the same tube.

FIGURE 2 illustrates how a number of filtering tubes 10 can be built in a more complex filter structure 24. The filter structure 24 comprises end flanges 26 at both ends. The filtering tubes 10 are fixed in these end flanges 26 by means of O-rings or by means of an epoxy 28. The filtering structure 24 is provided with outlet openings 30 to allow to discharge the filtered fluid.

FIGURE 3 illustrates a double layered web 32 of steel fibers. A layer 34 of steel fibers with a diameter of e.g. 2 μm is presintered and highly compacted, e.g. by means of cold isostatic pressing, to a porosity below

65% and to a thickness of e.g. 0.20 mm. A second layer 36 of a non-woven web of steel fibers with a thicker diameter, e.g. 6.5 μm , is sintered and compacted to the first layer 34. The porosity of the second layer 36 remains above 70%, e.g. above 80%, in order to allow subsequent compacting in the overlapping zone during the welding operation. The thickness of the compacted second layer is e.g. 0.40 mm so that the total thickness of the two-layered web is 0.60 mm. The flat two-layered web is preshaped and subsequently formed into a cylindrical form with an overlapping zone 38, as illustrated in FIGURE 4a. The non-welded cylindrical form is then shifted over a copper bar 42. FIGURE 4b shows how a continuous resistance weld 43 is formed in the overlapping zone by means of a resistance wheel 44. During this resistance welding the resistance wheel 44 compacts the web to such a degree that the double thickness in the overlapping zone is reduced to approximately a single thickness at the resistance weld 43. This compacting is made possible by the highly porous nature (above 70%) of at least one of the layers of the web of steel fibers. FIGURE 4c illustrates the overlapping zone 38 after the welding operation.

If a filtering tube 10 according to the invention is properly welded and if it is submitted to a bubble point test after welding, it must show the first bubbles coming out in zones outside the welding zone, which means that the greatest pore sizes must lie outside the welding zone.

The welded filtering tube 10 can be sintered again to eliminate stresses and straighten the tube. It has been experienced that the filtering tubes can withstand a pressure of at least 4 bar from the outside to the inside.

FIGURE 5 shows a transversal cross-section of an advantageous embodiment of the invention. A cylindrical rod 46 is put centrally in the cylindrical body 12. This is done to reduce the cross-section surface so that the amount of fluid output is reduced and so are the pump and energy costs.

-7-

In a preferred embodiment of the invention, a vortex 48 is located centrally in the cylindrical body 12, as is shown in FIGURE 6. This vortex 48 has the same effect of the cylindrical rod 46 in FIGURE 5 : Reduction of the available surface to reduce the fluid output and the required pump and energy costs. However, in addition to this advantage, the form of the vortex 48 creates many local turbulences which may prevent particle material from gathering at the inner surface of the filter.

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CLAIMS

1. A filtering tube (10) comprising one or more layers (34, 36) of a presintered web of steel fibers, characterized in that at least one of said layers comprises steel fibers with a diameter smaller than 8 μm , and in that said layers are preshaped, said layers overlapping with each other forming an overlapping zone (38), said overlapping zone comprising a continuous resistance weld (16).
2. A tube according to claim 1 wherein said tube has filter rating less than 20 micrometer.
3. A tube according to any one of the preceding claims wherein said tube has an internal diameter ranging from 8 mm to 200 mm.
4. A tube according to any one of the preceding claims wherein at least one of said layers has a porosity greater than 70 %.
5. A tube according to any one of claims 2 to 4 wherein said tube comprises two layers, one of said layers having a porosity smaller than 65 %.
6. A tube according to claim 5 wherein said layer with a porosity smaller than 65 % has been cold isostatically pressed.
7. A tube according to any one of the preceding claims wherein the greatest pore sizes lie outside said overlapping zone.
8. A tube according to any one of the preceding claims wherein said tube has been sintered.
9. A tube according to any one of the preceding claims said tube comprising a central rod with a diameter smaller than the internal

-9-

diameter of said tube.

10. A tube according to any one of claims 1 to 8, said tube comprising a
central vortex or worm with a diameter smaller than the internal
diameter of said tube.

11. A tube according to any one of the preceding claims wherein said
tube comprises a stainless steel end cap.

12. A tube according to any one of claims 1 to 10 wherein said tube
comprises an end cap made of a plastic material.

13. A tube according to any one of the preceding claims wherein said
tube further comprises a supplemental layer of a presintered web of
steel fibers with a diameter greater than 8 μm , said supplemental
layer functioning as a support layer.

14. A cross-flow filtering tube according to any one of the preceding
claims.

(19) World Intellectual Property Organization
International Bureau



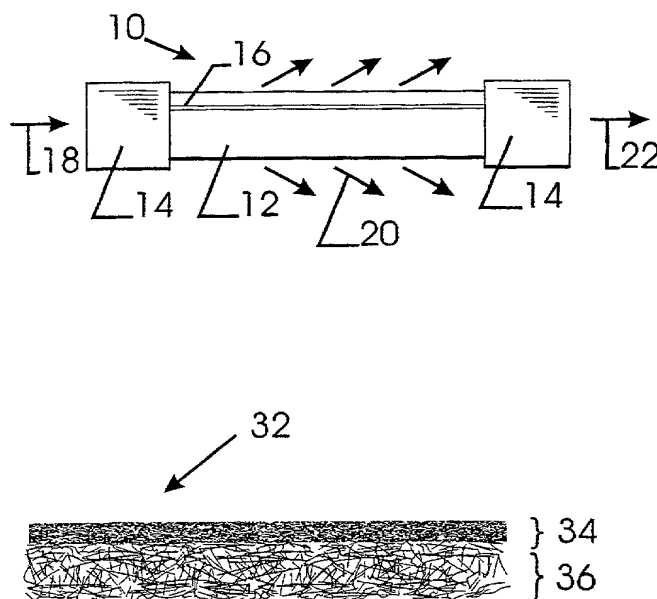
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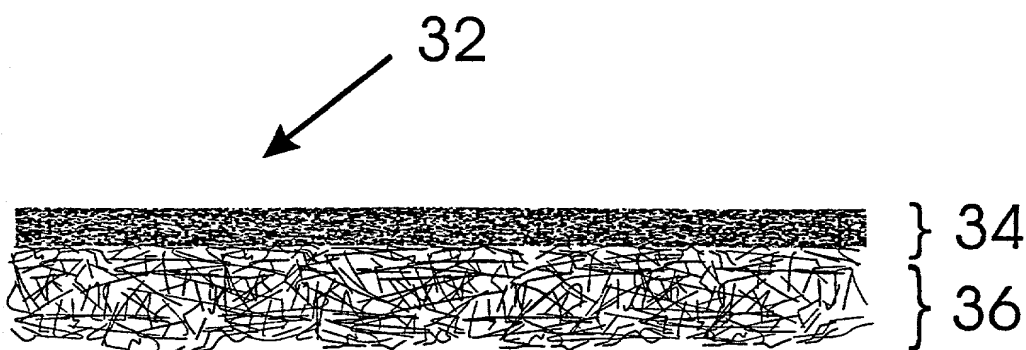
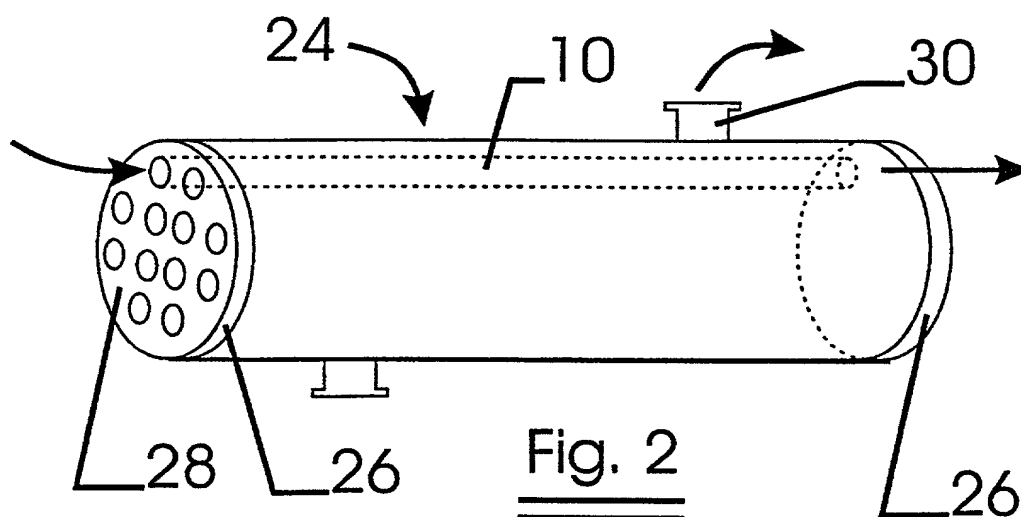
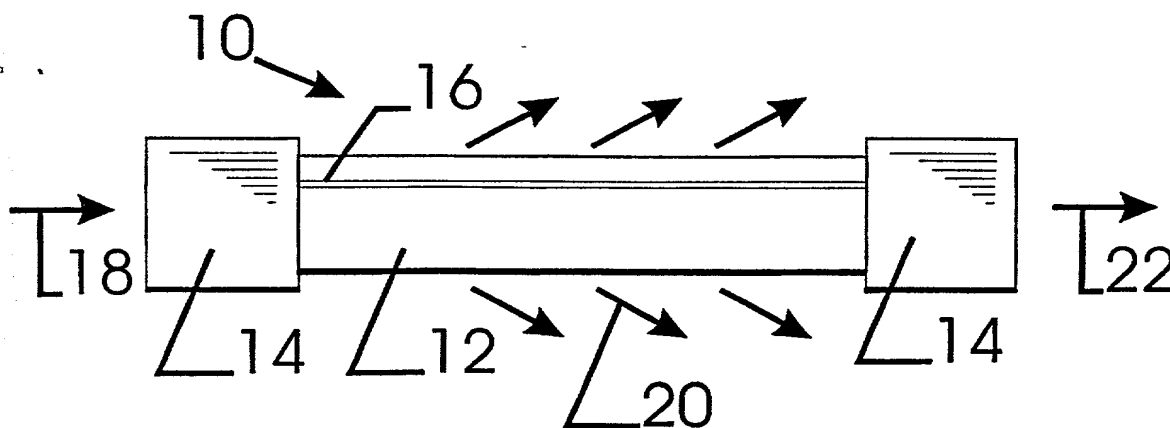
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- (71) Applicant (for all designated States except US): N.V. BEKAERT S.A. [BE/BE]; D.I.E. - 4011, Bekaertstraat 2, B-8550 Zwevegem (BE).
- (72) Inventors; and
- (75) Inventors/Applicants (for US only): VANDEMAELE, Noël [BE/BE]; Bottenhoek 10, B-8540 Deerlijk (BE). VANHOUTTE, Guy [BE/BE]; Deken Camerlyncklaan 18, B-8500 Kortrijk (BE).
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- Published:
— With international search report.
- For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

(54) Title: WELDED MICROFILTER TUBE COMPRISING SINTERED FIBERS



(57) Abstract: A filtering tube (10), e.g. a cross-flow filtering tube, comprises one or more layers (34, 36) of a presintered web of steel fibers. At least one of the layers has steel fibers with a diameter smaller than 8 μm . The layers are preshaped. The layers overlap with each other and form an overlapping zone (38). The overlapping zone comprises a continuous resistance weld (16).



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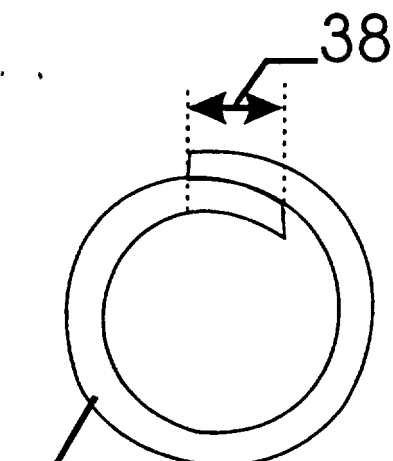


Fig. 4a

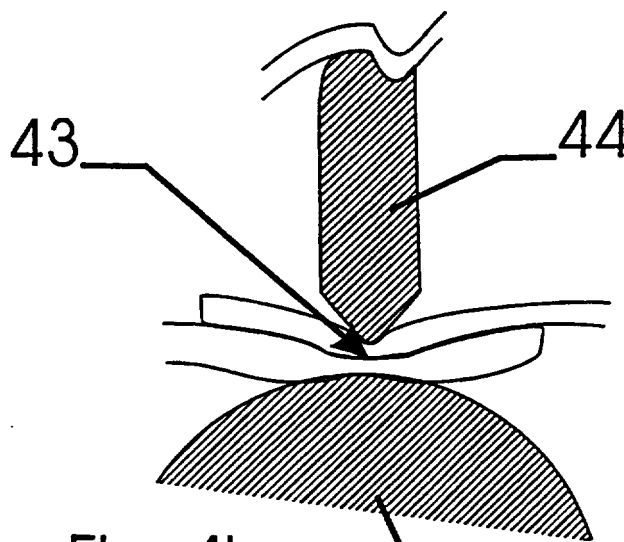


Fig. 4b

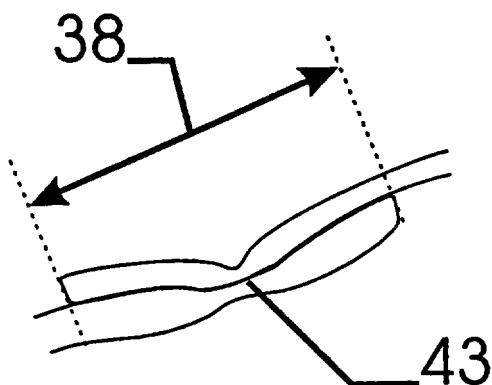


Fig. 4c

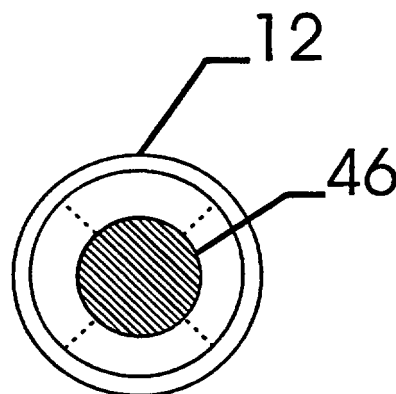


Fig. 5

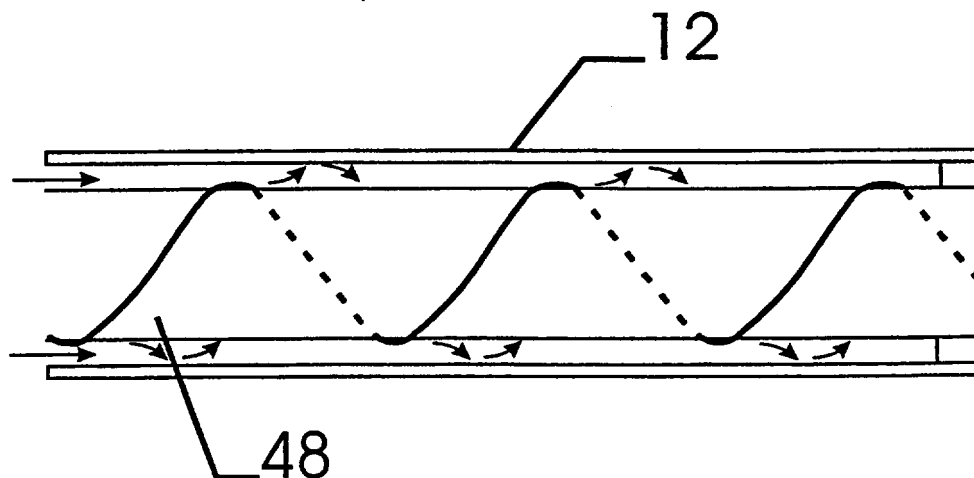


Fig. 6

20240907 20240907

DECLARATION AND POWER OF ATTORNEY

As a below named inventor, I HEREBY DECLARE:

THAT my residence, post office address, and citizenship are as stated below next to my name;

THAT I believe I am the original, first, and sole inventor (if only one inventor is named below) or an original, first, and joint inventor (if plural inventors are named below or in an attached Declaration) of the subject matter which is claimed and for which a patent is sought on the invention entitled

WELDED MICROFILTER TUBE COMPRISING SINTERED FIBERS

(Attorney Docket No. 016782-0245)

the specification of which (check one)

 is attached hereto.

 X was filed on July 19, 2000 as United States Application Number or PCT International Application Number PCT/EP00/06985 and was amended on _____ (if applicable).

THAT I do not know and do not believe that the same invention was ever known or used by others in the United States of America, or was patented or described in any printed publication in any country, before I (we) invented it;

THAT I do not know and do not believe that the same invention was patented or described in any printed publication in any country, or in public use or on sale in the United States of America, for more than one year prior to the filing date of this United States application;

THAT I do not know and do not believe that the same invention was first patented or made the subject of an inventor's certificate that issued in any country foreign to the United States of America before the filing date of this United States application if the foreign application was filed by me (us), or by my (our) legal representatives or assigns, more than twelve months (six months for design patents) prior to the filing date of this United States application;

THAT I have reviewed and understand the contents of the above-identified specification, including the claim(s), as amended by any amendment specifically referred to above;

THAT I believe that the above-identified specification contains a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the invention, and sets forth the best mode contemplated by me of carrying out the invention; and

THAT I acknowledge the duty to disclose to the U.S. Patent and Trademark Office all information known to me to be material to patentability as defined in Title 37, Code of Federal Regulations, §1.56.

10070462-030702

I HEREBY CLAIM foreign priority benefits under Title 35, United States Code § 119(a)-(d) or § 365(b) of any foreign application(s) for patent or inventor's certificate, or § 365(a) of any PCT international application which designated at least one country other than the United States of America, listed below and have also identified below any foreign application for patent or inventor's certificate or of any PCT international application having a filing date before that of the application on which priority is claimed.

Prior Foreign Application Number	Country	Foreign Filing Date	Priority Claimed?
99202928.0	EUROPE	September 10, 1999	YES

I HEREBY CLAIM the benefit under Title 35, United States Code § 119(e) of any United States provisional application(s) listed below.

U.S. Provisional Application Number	Filing Date

I HEREBY CLAIM the benefit under Title 35, United States Code, § 120 of any United States application(s), or § 365(c) of any PCT international application designating the United States of America, listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States or PCT International application in the manner provided by the first paragraph of Title 35, United States Code, § 112, I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, § 1.56 which became available between the filing date of the prior application and the national or PCT international filing date of this application.

U.S. Parent Application Number	PCT Parent Application Number	Parent Filing Date	Parent Patent Number

I HEREBY APPOINT the following registered attorneys and agents of the law firm of FOLEY & LARDNER:

STEPHEN A. BENT	Reg. No. 29,768
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to have full power to prosecute this application and any continuations, divisions, reissues, and reexaminations thereof, to receive the patent, and to transact all business in the United States Patent and Trademark Office connected therewith.

I request that all correspondence be directed to:

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PATENT TRADEMARK OFFICE

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I UNDERSTAND AND AGREE THAT the foregoing attorneys and agents appointed by me to prosecute this application do not personally represent me or my legal interests, but instead represent the interests of the legal owner(s) of the invention described in this application.

I FURTHER DECLARE THAT all statements made herein of my own knowledge are true, and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

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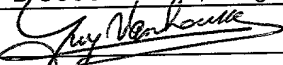
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